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Jyrki Mikkola

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EXAMINER

HOLLIDAY, JAIME MICHELE

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/748,698	Applicant(s) MIKKOLA, JYRKI	
	Examiner JAIME M. HOLLIDAY	Art Unit 2617	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 February 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Response to Amendment

Response to Arguments

Applicant's arguments filed February 27, 2008 have been fully considered but they are not persuasive.

Applicants basically argue that the cited prior art of references do not suggest “the periodic movement occurs in a substantial portion of the planar element beyond the location of the piezoelectric element.” Also, Applicants argue that the first branch and second branch are coplanar and that the piezoelectric elements of Weber are not coplanar. Examiner respectfully disagrees, because, although the microstrip antenna is not larger than the piezoelectric layer, the microstrip antennas are used as smart patches on a smart structure and are used to actuate the structure (planar element) (fig. 1, fig. 10, col. 7 lines 20-22). Further, Weber is incorporated to teach that there is a second piezoelectric element on a radiating plane (two thin film piezoelectric resonators are electrically isolated but acoustically coupled so that the energy, which is passed between the electrical elements, coupled to one resonator and the electromagnetic radiating elements coupled to the other resonator are interfaced only by way of the acoustical coupling [fig. 1, col. 2 lines 16-19, 30-45, col. 6 lines 60-67]). However, the claim does not recite the branches are co-planar, although the primary references teach that the radiating planes have two branches that are coplanar (fig. 1, fig. 7).

Therefore, in view of the preceding arguments, Examiner maintains previous rejection on previously presented claims.

Applicant's arguments with respect to claims 5, 6 and 9 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
2. **Claims 1 and 10** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Pankinaho (U.S. Patent # 6,140,966)** in view of **Khorrami et al. (U.S. Patent # 5,970,393)**.

Consider **claim 1**, Pankinaho clearly shows and discloses a planar antenna, the radiating antenna element of which includes at least two lips, thus providing the antenna structure with two separate resonance frequencies. The antenna system is adapted for carrying out internal multifrequency antenna systems for small mobile stations. The antenna may be attached to the back part of a two piece case of a mobile station (it is inherent that this mobile station includes the basic interior circuitry known in the art, reading on the claimed "audio amplifier"), reading on the claimed "integrated radio telephone structure, which radio telephone comprises an audio amplifier; and at least one planar element for both a first and a second function, said planar element belonging to a radiating plane an antenna in the radio telephone, and the radiating plane of said

antenna comprising a first branch and a second branch to produce two different frequency bands,” (fig. 6, col. 2 lines 12-15, col. 6 lines 32-35, col. 7 lines 26-29).

However, Pankinaho fails to specifically disclose that there is a piezoelectric element attached to the planar antenna, and that the second function is periodic movement of the planar element.

In the same field of endeavor, Khorrami et al. clearly show and disclose a sensing and actuating, reading on the claimed “second function,” antenna. This structure includes a microstrip antenna, an antenna substrate, a piezoelectric layer and a back ground plane (col. 8 lines 45-51). A radio signal is received by the sensing antenna at the other end, producing a received (microwave) voltage, v_c , across the output terminals of the sensing antenna. A sensing voltage, v_s , is generated across the piezoelectric substrate due to a response of the structure (e.g., mechanical vibration of the structure) on which the sensing antenna is mounted. A microstrip actuating antenna **506** is used in a wireless communication system **501** for actuation of a structure. A control signal from the control signal source is modulated by a radio-frequency signal from the microwave signal source by the modulator so as to form an activation signal, which is transmitted by the transmitter antenna. The signal received by the actuation antenna is converted to activation power signal using the non-linear element. The non-linear function of the element can be implemented using an electronic diode or by the microwave non-linearity of a substrate used with the antenna. The substrate for the antenna may be piezoceramic. The control

signal, v_a , is modulated with a microwave carrier signal, v_c , of frequency, f_c , tuned to the resonant frequency of the actuator antenna. The received signal at the actuator antenna is demodulated by a non-linear element. A microwave diode may be used for such non-linear function, which alternatively may be performed by the microwave non-linearity of the piezoelectric substrate. The demodulated actuation signal, v_a , can then be fed back with some voltage shifting electronics (low power circuits) to the antenna input for actuation of the piezoelectric layer, reading on the claimed "the second function being periodic movement of the planar element, for which the structure comprises a piezoelectric element attached to said planar element, wherein periodic movement occurs in a substantial portion of the planar element beyond the location of the piezoelectric element," (fig. 10, col. 7 lines 14-44, col. 8 lines 10-44).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have an actuating antenna that is activated by a voltage through a piezoelectric substrate as taught by Khorrami et al., in the antenna system of Pankinaho, in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7).

Consider **claim 10**, Pankinaho, as modified by Khorrami et al., clearly shows and discloses the claimed invention **as applied to claim 1 above**, and in addition, Khorrami et al. further disclose that the smart material may be piezoelectric ceramic, reading on the claimed "piezoelectric element is made of a ceramic material," (col. 7 lines 45-50).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have an actuating antenna that is activated by a voltage through a piezoelectric substrate as taught by Khorrami et al., in the antenna system of Pankinaho, in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7).

3. **Claims 2 and 3** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Pankinaho (U.S. Patent # 6,140,966)** in view of **Khorrami et al. (U.S. Patent # 5,970,393)**, and in further view of **Mähringer (U.S. Patent # 6,927,732 B2)**.

Consider **claim 2**, and **as applied to claim 1 above**, Pankinaho, as modified by Khorrami et al., clearly shows and discloses the claimed invention, except that the actuation of the antenna generates sound.

In the same field of endeavor, Mähringer clearly shows and discloses a communication terminal provided with an electromagnetic transmission or receiving antenna, an acoustic converter, preferably housed in a mobile telephone, reading on the claimed "integrated radio telephone." A shaped membrane is incorporated in the surface of a planar antenna to generate sound. The membrane could be configured as a thinner section of material in the antenna surface, connected continuously or only partially to the antenna surface. The membrane contains a piezo-ceramic layer. Piezo-electrical materials are characterized by a significant interaction between their electrical and mechanical characteristics, and by applying an electrical field mechanical deformations are

produced. If an electrical voltage is applied to this electric connection on the piezo-ceramic layer, the piezo-ceramic layer deforms and the membrane is tensioned downwards mechanically. Acoustic sound is generated by the transitioned from the rest position of the tensioned position, reading on the claimed “piezoelectric element is coupled to an audio amplifier output, whereby said periodic movement of the planar element causes generation of sound,” (abstract, column 2 lines 53-60 and column 3 lines 4-10, col. 4 lines 7-11).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a piezo-ceramic layer to create acoustic sound as taught by Mähringer, in the antenna system of Pankinaho, as modified by Khorrami et al., in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

Consider **claim 3**, the combination of Pankinaho and Khorrami et al., as modified by Mähringer, clearly shows and discloses the claimed invention **as applied to claim 2 above**, and in addition, Pankinaho further discloses a radiating element **100** of the antenna, reading on the claimed “said planar element is the first branch of the radiating plane,” (fig. 1, col. 3 line 24-25).

4. **Claim 4** is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Pankinaho (U.S. Patent # 6,140,966)** and **Khorrami et al. (U.S. Patent**

5,970,393 in view of **Mähringer (U.S. Patent # 6,927,732 B2)**, and in further view of **Weber (U.S. Patent # 5,361,077)**.

Consider **claim 4**, and **as applied to claim 3 above**, the combination of Pankinaho and Khorrami et al., as modified by Mähringer, clearly shows and discloses the claimed invention except that there is a second piezoelectric or piezoceramic element on the antenna.

In the same field of endeavor, Weber clearly shows and discloses an overmoded acoustically coupled antenna, wherein it is desirable to provide an acoustically coupled antenna having a substantially planar structure. The antenna includes a first thin film resonator having a first pair of electrodes and a first thin film piezoelectric element, and a second thin film resonator includes a second pair of electrodes and a second thin film piezoelectric element. The two thin film piezoelectric resonators are electrically isolated but acoustically coupled so that the energy, which is passed between the electrical elements, coupled to one resonator and the electromagnetic radiating elements coupled to the other resonator are interfaced only by way of the acoustical coupling. Acoustical coupling is accomplished by imposing an intervening substrate layer, reading on the claimed "a second piezoelectric element which is attached to the second branch of the radiating plane," (fig. 1, col. 2 lines 16-19, 30-45, col. 6 lines 60-67).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have two piezoelectric elements on an

antenna as taught by Weber, in the antenna system of Pankinaho and Khorrami et al., as modified by Mähringer, in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

5. **Claims 5 and 6** are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Pankinaho (U.S. Patent # 6,140,966)** and **Khorrami et al. (U.S. Patent # 5,970,393)**, in view of **Siwiak et al. (U.S. Patent # 5,410,749)**, and in further view of **Apostolos (US 2003/0020658 A1)**.

Consider **claim 5**, Pankinaho, as modified by Khorrami et al., clearly shows and discloses the claimed invention **as applied to claim 1 above**, and in addition, Pankinaho further discloses that the radiating antenna element is connected to the ground plane **140** at least at one point, reading on the claimed “antenna comprises a separate ground plane,” (fig. 2, col. 2 lines 40-41).

However, Pankinaho, as modified by Khorrami et al., fails to specifically disclose that piezoelectric material is on the ground plane.

In the same field of endeavor, Siwiak et al. clearly show and disclose a radio communication device having a microstrip antenna comprising a planar antenna element having first and second major surfaces, a ground plane coupled to the planar antenna element, (figure 2 and column 1 lines 55-59), and first and second feeders, which may be conductive materials, that extend from the second surface of the planar antenna element and in the ground plane, reading on the

claimed “a second piezoelectric element attached to the ground plane” (figure 2, col. 1 lines 55-59, col. 3 lines 55-58).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to attach feeders, made of conductive materials, reading on the claimed “piezoelectric material,” to a ground plane as taught by Siwiak et al. in the antenna system of Pankinaho, as modified by Khorrami et al., in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

However, the combination of Pankinaho and Khorrami et al., as modified by Siwiak et al., fails to specifically disclose that the piezoelectric elements are on the major surface of the ground plane.

In the same field of endeavor, Apostolos clearly shows and discloses electronically controlling the propagation constant of a VITL, where no switching or mechanical manipulation of the antenna is required. Each antenna 101, 103, and 105 is associated with a conductive reference plane, which in this case is ground plane **105**. An activation layer 109 (e.g., varactor or piezoelectric device) is deployed between sections of the antenna conductor and the ground plane. The activation layer may run the length of the antenna conductor or only under certain (e.g., all) low impedance sections **101b**. The activation layer of VITL 105 is implemented under the low impedance sections only. Piezoelectric devices could be selectively placed between the dielectric layer **107** and the ground plane as well. In such an embodiment, the stimulus would have to be applied to the

piezoelectric devices by a mechanism other than the VITL conductor. For example, a stimulus voltage could be applied directly to the piezoelectric devices, reading on the claimed "ground plane having a major surface; and a piezoelectric element attached to the major surface of the ground place," (paragraphs 18, 22, 37).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have piezoelectric devices on a ground plane as taught by Apostolos in the antenna system of Pankinaho and Khorrami et al., as modified by Siwiak et al., in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

Consider **claim 6**, the combination of Pankinaho and Khorrami et al., as modified by Siwiak et al. and Apostolos, clearly shows and discloses the claimed invention **as applied to claim 5 above**, and in addition, Apostolos further discloses piezoelectric devices could be selectively placed between the dielectric layer **107** and the ground plane as well, reading on the claimed "piezoelectric element is attached to the major surface of ground plane at a first fixedly-supported end thereof, and the second piezoelectric element is attached to the major surface of the ground plane at a second fixedly-supported end thereof" (fig. 3, paragraph 37).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made selectively place piezoelectric devices on

the ground plane a ground plane as taught by Apostolos et al. in the antenna system of Pankinaho and Khorrami, as modified by Siwiak et al., in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

6. **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Pankinaho (U.S. Patent # 6,140,966)** in view of **Khorrami et al. (U.S. Patent # 5,970,393)**, and in further view of **Siwiak et al. (U.S. Patent # 5,410,749)**.

Consider **claim 7**, and **as applied to claim 1 above**, Pankinaho, as modified by Khorrami et al., clearly shows and discloses the claimed invention except that the mobile station comprises a vibration oscillator and that a piezoelectric element is coupled to the oscillator and generates alarm vibration.

In the same field of endeavor, Siwiak et al. clearly show and disclose a radio communication device having a microstrip antenna comprising a planar antenna element having first and second major surfaces, and a ground plane coupled to the planar antenna element. Siwiak et al. further disclose first and second feeders, which may be conductive materials, that extend from the second surface of the planar antenna element and in the ground plane. The first and second feeders are present to electrically couple signals intercepted by the planar antenna element with primary receiver element circuits which comprise a conventional RF amplifier, a local oscillator, a mixer, and associated filters, reading on the claimed "radio telephone comprises a vibration oscillator, a

piezoelectric element being coupled to the vibration oscillator, whereby said periodic moving of the planar element is generation of alarm vibration" (figure 2, figure 5, column 1 lines 55-59, column 3 lines 55-58 and column 3 lines 60-65).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to attach an oscillator as taught by Siwiak et al. in the antenna system of Pankinaho, as modified by Khorrami et al., in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

7. **Claim 9** is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Pankinaho (U.S. Patent # 6,140,966)** and **Khorrami et al. (U.S. Patent # 5,970,393)** in view of **Beard (US 6,292,437 B1)**.

Consider **claim 9**, and **as applied to claim 1 above**, Pankinaho, as modified by Khorrami et al., clearly shows and discloses the claimed invention except that periodic movement of the planar element is caused by sound waves.

In the same field of endeavor, Beard clearly shows and discloses that a data terminal **10** additionally includes an electroacoustic transducer for converting acoustic signals into electrical signals, and thereby acts as a microphone. The electroacoustic transducer **26** may also be used convert electrical signals into acoustic signals and thereby act as a speaker. The electroacoustic transducer may be a piezoelectric or ceramic type transducer or may be a dynamic type transducer utilizing magnetic fields and mechanical

movements to create alternating currents. The data terminal also includes an acoustic signal capture actuator **28** which may be used to initiate and terminate the capturing of an acoustic signature, reading on the claimed “periodic movement of the planar element is caused by sound waves coming from outside the integrated radio telephone structure, and said piezoelectric element generates an electric signal corresponding to the sound waves” (abstract, col. 2 lines 44-55).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to produce electrical signals based on incoming acoustic signals as taught by Beard, in the antenna system of Pankinaho, as modified by Khorrami et al., in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

8. **Claim 11** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Pankinaho (U.S. Patent # 6,140,966)** in view of **Mähringer (U.S. Patent # 6,927,732 B2)**.

Consider **claim 11**, Pankinaho clearly shows and discloses a planar antenna, the radiating antenna element of which includes at least two lips, thus providing the antenna structure with two separate resonance frequencies. The antenna system is adapted for carrying out internal multifrequency antenna systems for small mobile stations. The antenna may be attached to the back part

of a two piece case of a mobile station (it is inherent that this mobile station includes the basic interior circuitry known in the art, reading on the claimed “audio amplifier”), reading on the claimed “integrated radio telephone structure comprising at least one planar antenna, having a radiating plane and a planar element, configured to perform radio-frequency; a radiating plane of said antenna comprising a first branch and a second branch to produce two different frequency bands,” (fig. 6, col. 2 lines 12-15, col. 6 lines 32-35, col. 7 lines 26-29).

However, Pankinaho fails to specifically disclose that there is a piezoelectric element attached to the planar antenna.

In the same field of endeavor, Mähringer clearly shows and discloses a communication terminal provided with an electromagnetic transmission or receiving antenna, an acoustic converter, preferably housed in a mobile telephone, reading on the claimed “integrated radio telephone.” A shaped membrane is incorporated in the surface of a planar antenna to generate sound. The membrane could be configured as a thinner section of material in the antenna surface, connected continuously or only partially to the antenna surface. The membrane contains a piezo-ceramic layer. Piezo-electrical materials are characterized by a significant interaction between their electrical and mechanical characteristics, and by applying an electrical field mechanical deformations are produced. Mechanical pressure on these materials, however, generates electrical charges. This structure therefore allows sound signals to be picked up, reading on the claimed “at least one planar antenna configured to perform radio-

frequency and audio-frequency operations, wherein the audio-frequency operations are periodic movement of said planar element; at least one piezoelectric element attached to the planar element, wherein the piezoelectric element induces a periodic movement of a substantial portion of the planar element beyond the location of the piezoelectric element" (abstract, column 2 lines 53-60 and column 3 lines 4-10).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to allow the piezoelectric element to generate electrical charge on a planar antenna as taught by Mähringer, in the antenna system of Pankinaho, in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7).

9. **Claim 12** is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Pankinaho (U.S. Patent # 6,140,966)** and **Khorrami et al. (U.S. Patent # 5,970,393)** in view of **Weber (U.S. Patent # 5,361,077)**, and in further view of **Siwiak et al. (U.S. Patent # 5,410,749)**.

Consider **claim 12**, Pankinaho clearly shows and discloses a planar antenna, the radiating antenna element of which includes at least two lips, thus providing the antenna structure with two separate resonance frequencies. The antenna system is adapted for carrying out internal multifrequency antenna systems for small mobile stations. The antenna may be attached to the back part of a two piece case of a mobile station (it is inherent that this mobile station

includes the basic interior circuitry known in the art, reading on the claimed “audio amplifier”), reading on the claimed “integrated radio telephone structure, which radio telephone comprises an audio amplifier; and at least one planar element for both a first, said planar element belonging to an antenna in the radio telephone, and a radiating plane of said antenna comprising a first branch and a second branch to produce two different frequency bands,” (fig. 6, col. 2 lines 12-15, col. 6 lines 32-35, col. 7 lines 26-29).

However, Pankinaho fails to specifically disclose that there is a piezoelectric element attached to the planar antenna, and that a second function is the movement of the planar element.

In the same field of endeavor, Khorrami et al. clearly show and disclose a sensing and actuating, reading on the claimed “second function,” antenna. This structure includes a microstrip antenna, an antenna substrate, a piezoelectric layer and a back ground plane (col. 8 lines 45-51). A radio signal is received by the sensing antenna at the other end, producing a received (microwave) voltage, v_c , across the output terminals of the sensing antenna. A sensing voltage, v_s , is generated across the piezoelectric substrate due to a response of the structure (e.g., mechanical vibration of the structure) on which the sensing antenna is mounted. A microstrip actuating antenna **506** is used in a wireless communication system **501** for actuation of a structure. A control signal from the control signal source is modulated by a radio-frequency signal from the microwave signal source by the modulator so as to form an activation signal,

which is transmitted by the transmitter antenna. The signal received by the actuation antenna is converted to activation power signal using the non-linear element. The non-linear function of the element can be implemented using an electronic diode or by the microwave non-linearity of a substrate used with the antenna. The substrate for the antenna may be piezoceramic. The control signal, v_a , is modulated with a microwave carrier signal, v_c , of frequency, f_c , tuned to the resonant frequency of the actuator antenna. The received signal at the actuator antenna is demodulated by a non-linear element. A microwave diode may be used for such non-linear function, which alternatively may be performed by the microwave non-linearity of the piezoelectric substrate. The demodulated actuation signal, v_a , can then be fed back with some voltage shifting electronics (low power circuits) to the antenna input for actuation of the piezoelectric layer, reading on the claimed "at least one planar element for both a first and a second function, and the second function being periodic movement of said planar element," (fig. 10, col. 7 lines 14-44, col. 8 lines 10-44).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have an actuating antenna that is activated by a voltage through a piezoelectric substrate as taught by Khorrami et al., in the antenna system of Pankinaho, in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7).

However, Pankinaho, as modified by Khorrami et al., fails to specifically disclose that there is a piezoelectric element attached to the planar antenna.

In the same field of endeavor, Weber clearly shows and discloses an overmoded acoustically coupled antenna, wherein it is desirable to provide an acoustically coupled antenna having a substantially planar structure. The antenna includes a first thin film resonator having a first pair of electrodes and a first thin film piezoelectric element, and a second thin film resonator includes a second pair of electrodes and a second thin film piezoelectric element. The two thin film piezoelectric resonators are electrically isolated but acoustically coupled so that the energy, which is passed between the electrical elements, coupled to one resonator and the electromagnetic radiating elements coupled to the other resonator are interfaced only by way of the acoustical coupling. Acoustical coupling is accomplished by imposing an intervening substrate layer, reading on the claimed "a first and second piezoelectric element, first piezoelectric element being attached to the first branch of the radiating plane and the second piezoelectric element being coupled to the second branch of the radiating plane, wherein the periodic movement occurs in a substantial portion of the planar element beyond the location of the first piezoelectric element and beyond the location of the second piezoelectric element," (fig. 1, col. 2 lines 16-19, 30-45, col. 6 lines 60-67).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have two piezoelectric elements on an antenna as taught by Weber, in the antenna system of Pankinaho, as modified

by Khorrami et al., in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

However, the combination of Pankinaho and Khorrami et al., as modified by Weber, fails to specifically disclose that there is a piezoelectric element attached to an oscillator.

In the same field of endeavor, Siwiak et al. clearly show and disclose a radio communication device having a microstrip antenna comprising a planar antenna element having first and second major surfaces, and a ground plane coupled to the planar antenna element. Siwiak et al. further disclose first and second feeders, which may be conductive materials, that extend from the second surface of the planar antenna element and in the ground plane. The first and second feeders are present to electrically couple signals intercepted by the planar antenna element with primary receiver element circuits which comprise a conventional RF amplifier, a local oscillator, a mixer, and associated filters, reading on the claimed "second piezoelectric element being coupled to the vibration oscillator" (figure 2, figure 5, column 1 lines 55-59, column 3 lines 55-58 and column 3 lines 60-65).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to attach an oscillator as taught by Siwiak et al. to the antenna of Pankinaho and Khorrami et al., as modified by Weber, in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

Conclusion

1. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAIME M. HOLLIDAY whose telephone number is (571)272-8618. The examiner can normally be reached on Monday through Friday 7:30am to 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, V. Paul Harper can be reached on (571) 272-7605. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jaime M Holliday/
Examiner, Art Unit 2617